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was previously indicated by the internal antidromy of *Liquidambar*. I may add that the flowers on one plant of *Hibiscus Syriacus* show a tendency to twist in relatively opposite directions; and though the phyllotaxy of that species is not easily determined (the right and left spirals being almost similar), yet in some cases opposite orders of spirality can be found on neighboring branches.

My friend, Prof. F. E. Lloyd, informs me that in the cycadaeous species *Encephalartos Altensteinii* he finds the cones on the same tree relatively antidromic. This accords with the condition of the allied coniferous order.

PRINCETON UNIVERSITY, November 3, 1896.

### Reviews.

*Some Analogies in the Lower Cretaceous of Europe and America.*

Lester F. Ward. Reprinted from 16th Ann. Rept. U. S. Geol. Survey, Part I., 1894-1895 [Washington, 1896], pp. 463-542. *Plates xcvi.-cxviii. and illust. in text.*

This important contribution is of interest to both the botanist and the geologist on account of the use which is made of palaeobotanical evidence in the correlation of geologic horizons. The comparisons are chiefly made between the Potomac formation of America and the Wealden of Europe, and the author has taken a very broad and liberal view of what should be included under the latter, giving it a wider range at each extremity than is usually conceded to it. In this connection a plea is made for dual nomenclature in geology, according to the point of view from which observations are made. From the standpoint of fossils alone the Wealden would be restricted to narrower limits than if considered stratigraphically, that is from the standpoint of origin and manner of deposition of sediments.

Stratigraphically the Wealden would have to include part of what we have usually regarded as Jurassic with some of the lower Cretaceous. The method of formation and lithologic characters of the Wealden, as thus defined, evidently correlate it very closely with our lower Potomac formation, that is to say the strata are largely of estuary or fluvial origin and consist of alternating sands

and clays, comprising a well marked geologic unit stratigraphically.

The author does not think that the lowest portion of the Potomac (equivalent to the Purbeck beds of the old world) have yet been found, and as the great angiospermous flora of the upper Potomac (Amboy clays, etc.) is not represented in England, a comparison of the English Wealden with any portion of our Cretaceous would be practically restricted to the middle and lower Potomac of the East as far as known, and to the Trinity and Kootanie of the West. In the table of distribution of the Wealden flora the range is extended geologically and geographically so as to include from the upper Jurassic to the middle Cretaceous in all parts of the world where the flora has been recognized, thus giving at once a complete list of the plants and a complete representation of their distribution vertically and laterally.

From the comparisons thus made it is evident that our lower Potomac flora has so much in common with that of the Wealden that the strata which contain it must be regarded as equivalent, whether we eventually decide them to be Jurassic or Cretaceous.

In any enumeration of this flora, cycads necessarily play an important part and cycadean trunks have received special attention from the author. Plate xcix. shows a group of twenty-one from the Purbeck beds of the Isle of Portland, England; plate c., fourteen from the Potomac formation of Maryland; plate ci., eight from the lower Cretaceous of the Black Hills, and plates ciii. and civ., two species from the scaly clays of Italy.

The fossil forests of the Isles of Wight and Portland are also described, and from the wood collected by the author sections were prepared from which two new species are described by Dr. F. H. Knowlton: *Araucarioxylon Wallacei* and *A. Webbii*.

In discussing the Mesozoic of Portugal, tables of geologic distribution of species for that country are given and interesting comparisons are made between the floras of certain localities and that of the Potomac.

The portion of greatest interest to the botanist, however, may be found under the chapter on Archetypal Angiosperms. It was long recognized by palaeobotanists that the highly developed angiosperm flora of the Dakota Group, Atone beds, Amboy clays,

etc., and their equivalents, containing many genera identical with those now living, must have had a more simple ancestry, and in the lower Potomac and Wealden this ancestry seems to be represented, and on plates cvi. and cvii., figures are given of some of these plants from both foreign and home localities, in order that they may be compared. Such an eminent authority as Saporta was in doubt as to their precise affinities, and classed them all under a special group, which he called Proangiosperms. When the entire flora of the lower Potomac shall have been described, we may hope to have many more representatives of these archaic types which will be of absorbing interest to the student of plant development.

A. H.

*Grasses of North America.* W. J. Beal, M.A., M.S., Ph.D., Professor of Botany and Forestry in Michigan Agricultural College. 2 volumes. Henry Holt & Co.

The first volume of this work appeared in 1887, and was devoted to a consideration of the physiological and economic part of the subject. The second volume, which has just been published, treats of the grasses from the standpoint of the systematist. A classification of all the forms growing wild and introduced in North America and Mexico is attempted, the inclusion of those from the latter country much increasing the difficulty of the undertaking. The value of the work is greatly marred by the treatment of the plants in too large and comprehensive groups. This applies both to genera and species. To illustrate this in relation to genera, *Andropogon* may be selected as an example. In this such good and well-marked genera as *Sorghum*, *Heteropogon* and *Chrysopogon*, natural groups that are altogether too distinct to be considered as mere parts of one group, are included. In *Panicum* this same plan of extreme aggregation has been followed, both generically and specifically. In *P. dichotomum* L. the objectionable feature of this method is particularly noticeable. Six or eight good and valid species are here treated as a polymorphous one. While there may be considerable trouble as yet with the forms which have been called *P. pubescens* of Lamarck, certainly such well-marked grasses as *P. ciliatum* Ell., *P. ensiflorum* Baldwin, and what is called *P. barbulatum* Mx. are clear and distinct enough from casual observation to be kept apart as specifically distinct.

They surely should not be made into one polymorphous species, as here treated, no attempt being made to separate them even as varieties, while *P. laxiflorum* Lam. is considered worthy of varietal rank, although its limitations are less distinct than those of the species referred to above.

The present volume is plainly though neatly bound, the type clear and distinct. Some of the figures, however, do not come up as clearly as might be desired. It is the only work in this country which attempts to cover the forms from Mexico, and is a welcome addition to the literature of this difficult family of plants.

G. V. N.

*Sphagna Boreali-Americana exsiccata.* Prepared by Daniel Cady Eaton and Edwin Faxon. Issued by George F. Eaton, New Haven, Conn., October, 1896.

We have received the first two centuries of these very interesting North American Peat-Mosses, and are much pleased with the number and variety of species represented, the neat manner in which they are put up and the wide geographical range of the collections distributed. The bulk of the collections have been made by Edwin Faxon and Prof. Eaton in the New England States, to which Prof. Farlow and Edward L. Rand have also contributed. Dr. Evans has gathered many species in New Jersey, and Dr. Small in the Southern States, Mrs. A. M. Nicholson and C. H. Baker in Florida, A. C. Waghorne in Newfoundland, and Sandberg and Leiberg in Washington. Besides this there are a few rare arctic species from Hudson Bay and Alaska, collected by George Comer and C. H. Townsend.

We have all felt the great loss that American bryologists suffered in Prof. Eaton's death, and are glad to learn that his work was so far completed that his son has been able to issue this most attractive and useful collection.

E. G. B.

### Proceedings of the Club.

TUESDAY EVENING, NOVEMBER 24TH, 1896.

Vice-President Allen occupied the chair and there were 20 persons present.